

Please add new Claims 21-23 as follows:

21. (New) The substrate according to Claim 1, wherein the adhesion promoter comprises at least one of an inorganic material and an organic/inorganic hybrid material.

22. (New) A substrate comprising:

a fibrous material; and

a photocatalytic coating material coating at least a portion of the fibrous material and including a photocatalytic semi-conducting material and an adhesion promoter for promoting adhesion to the fibrous material, the photocatalytic semi-conducting material comprising a sulphide material.

23. (New) The substrate according to Claim 22, wherein the sulfide material is selected from the group consisting of zinc sulfide and boron sulfide.

REMARKS

Favorable consideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-11, 13-18 and 20-23 are presently pending in this application, Claims 12 and 19 having been canceled, Claims 1-3, 13 and 15 having been amended and Claims 21-23 having been newly added by the present amendment.

In the outstanding Office Action, Claim 4 was objected to for being improper dependent form; Claim 15 was rejected under 35 U.S.C. §112, second paragraph, for being indefinite; Claims 1 and 10 were rejected under 35 U.S.C. §103(a) as being unpatentable over JP 08-252305 (hereinafter "JP '305"); Claims 1-9 and 11-19 were rejected under 35 U.S.C. §103(a) as being unpatentable over Murasawa et al. (U.S. Patent 5,547,823); and Claim 20

was rejected under 35 U.S.C. §103(a) as being unpatentable over Murasawa et al. in view of JP 08-269391 (hereinafter "JP '391").

With regard to the objection of Claim 4, Claim 4 has been amended herein, and as a result is believed to overcome this objection.

With regard to the rejection under 35 U.S.C. §112, second paragraph, Claim 15 has been amended to clarify the subject matter recited therein. Thus, Claim 15 is believed to be in compliance with the requirements of the statute. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work in a joint effort to derive mutually satisfactory claim language.

Newly added Claims 21-23 are believed to find support in the specification, claims and drawings as originally filed. For example, Claim 21 is supported by previous Claim 4, and Claims 22 and 23 are supported by page 2, lines 11-26, of the specification as originally filed. Hence, no new matter is believed to be added thereby.

Briefly, Claim 1 of the present invention as amended is directed to a substrate including a fibrous material, and a photocatalytic coating material coating at least a portion of the fibrous material and including a photocatalytic semi-conducting material and an adhesion promoter for promoting adhesion to the fibrous material, wherein the photocatalytic semi-conducting material comprises titanium oxide which is at least partly crystalized in anatase form and the photocatalytic coating material coats fibers in the portion of the fibrous material over a thickness of between 30 and 50 nm. By providing such a photocatalytic coating material, the photocatalytic semi-conducting material sheathes the fibrous material to more efficiently ensure the effectiveness of the photocatalytic coating material by taking an advantage of a mean crystallite size of the titanium oxide at least partly crystalized in anatase

form.¹

The outstanding Office Action asserts that the substrate recited in Claim 1 is rendered obvious over JP '305 and Murasawa et al. because these references disclose the substrate recited in Claim 1 except the thickness of the photocatalytic coating material between 30 and 50 nm. It is, however, respectfully submitted that neither JP '305 nor Murasawa et al. teach "a photocatalytic coating material coating at least a portion of the fibrous material and including a photocatalytic semi-conducting material and an adhesion promoter for promoting adhesion to the fibrous material, wherein the photocatalytic semi-conducting material comprises titanium oxide which is at least partly crystalized in anatase form and the photocatalytic coating material coats fibers in the portion of the fibrous material over a thickness of between 30 and 50 nm" as recited in amended Claim 1. As mentioned above, Applicants discovered that the recited thickness of the photocatalytic coating material coating the fibers better ensures its photocatalytic effects because of the mean crystallite size of the titanium oxide in anatase form. On the other hand, nowhere in JP '305 and Murasawa et al. disclose or suggest that the mean crystallite size of the titanium oxide in anatase form would be determinative in the effective thickness of the photocatalytic coating material. Therefore, the structure recited in Claim 1 is believed to be patentably distinguishable from JP '305 and Murasawa et al.

Because neither one of JP '305 and Murasawa et al. discloses the thickness of photocatalytic coating material containing the titanium oxide in anatase form as recited in Claim 1, even the combined teachings of these cited references are not believed to render the structure recited in Claim 1 obvious.

Likewise, independent Claim 13 is believed to include subject matter substantially

¹ Specification, page 10, lines 9-21.

similar to what is recited in Claim 1 to the extent discussed above. Thus, Claim 13 is also believed to be distinguishable from JP '305 and Murasawa et al.

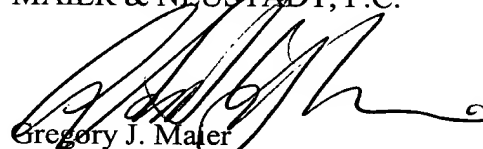
Turning to Claim 22, Claim 22 is directed to a substrate including a fibrous material and a photocatalytic coating material coating at least a portion of the fibrous material and including a photocatalytic semi-conducting material and an adhesion promoter for promoting adhesion to the fibrous material, the photocatalytic semi-conducting material comprising a sulphide material. However, neither JP '305 nor Murasawa et al. are believed to teach "a photocatalytic coating material coating at least a portion of the fibrous material and including a photocatalytic semi-conducting material and an adhesion promoter for promoting adhesion to the fibrous material, the photocatalytic semi-conducting material comprising a sulphide material" as recited in Claim 22. Thus, the subject matter recited in Claim 22 is believed to be distinguishable from both JP '305 and Murasawa et al.

For the foregoing reasons, Claims 1, 13 and 22 are believed to be allowable. Furthermore, since Claims 2-11, 14-18, 20 and 23 ultimately depend from one of Claims 1, 13 and 22, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 2-11, 14-18, 20 and 23 are believed to be allowable as well.

In view of the amendments and discussions presented above, Applicants respectfully submit that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

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Marked-Up Copy
Serial No: 09/719,153
Amendment Filed on:
May 5, 2003

IN THE CLAIMS

Please cancel Claims 12 and 19 without prejudice, and amend Claims 1-3, 13 and 15 as follows:

--1. (Twice Amended) A substrate comprising:

a fibrous material; and

a photocatalytic coating material coating at least a portion of the fibrous material and including a photocatalytic semi-conducting material and an adhesion promoter for promoting adhesion to the fibrous material, [the photocatalytic semi-conducting material being selected from the group consisting of an oxide semi-conducting material and a sulphide semi-conducting material,]

wherein the photocatalytic semi-conducting material comprises titanium oxide which is at least partly crystalized in anatase form and the photocatalytic coating material coats fibers in the portion of the fibrous material over a thickness of between 30 and 50 nm.

2. (Twice Amended) The substrate according to Claim 1, wherein[:

the photocatalytic semi-conducting material comprises titanium oxide which is at least partly crystalized in anatase form; and] the titanium oxide is in a form of one of particles in colloidal suspension and a powder.

3. (Twice Amended) The substrate according to Claim 1, wherein the photocatalytic semi-conducting material comprises a titanium oxide from one of thermal decomposition of organometallic and at least one metal halide precursor in the photocatalytic coating material.

12. (Canceled)

13. (Twice Amended) A process for manufacturing a substrate, comprising:

depositing a liquid binder to bind fibers and form a fibrous material; and

depositing a photocatalytic coating material in liquid phase over at least a portion of the fibrous material such that the photocatalytic coating material coats fibers in the portion of the fibrous material over a thickness of between 30 and 50 nm, the photocatalytic material including a photocatalytic semi-conducting material and an adhesion promoter for promoting adhesion to the fibrous material, [the photocatalytic semi-conducting material being selected from the group consisting of an oxide semi-conducting material and a sulphide semi-conducting material]

wherein the photocatalytic semi-conducting material comprises titanium oxide at least partially crystallized in anatase form.

15. (Twice Amended) The process according to Claim 13, wherein the depositing the photocatalytic coating material comprises depositing the photocatalytic material [during a conversion operation of] while the fibrous material is being formed into mats.

19. (Canceled)--

Please add new Claims 21-23 as follows:

--21.-23. (New)--